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THE FUNCTION AND EFFECT OF BROMINE IN THE ANIMAL ORGANISM.
I. DISTRIBUTION OF BROMIDES IN THE ORGANISM OF RATS
AS DETERMINED WITH THE AID OF RADIOACTIVE BROMINE

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Bromine normally occurs in the organism of animals. Although both animals and plants concentrate this element and enrich it with respect to the surrounding medium (Selivanov 1939, 1944, 1946), the resulting concentration is still too low for convenient analytical determination. The use of a radioactive isotope of bromine as an indicator in an investigation of the pharmacological action of bromine and bromine compounds is of advantage in that it permits a precise determination of the distribution of bromine in various parts of the organism and enables one to trace all concentration shifts. At present, the precise function of bromine naturally occurring in the organism is not known. The metabolism of bromine introduced for therapeutic purposes and the differences in the minimum dosage required in order to bring about the inhibiting effect have also not been clarified.

Br⁸² was used in this investigation. It was obtained by irradiating bromobenzene. In view of the fact that radioactive bromine is formed in the ionic state, it can be dissolved in water. By shaking out irradiated bromobenzene in a separatory funnel with 100 milliliters of water, 75 percent of the radioactive bromine contained in the bromobenzene could be extracted. Further enrichment was achieved by evaporating the aqueous extract in the presence of a few milligrams of KBr. The latter by virtue of the alkaline reaction created in the solution prevents evaporation of the volatile bromine and serves as a carrier. The experimental solution is introduced into the animal 20-25 hours after irradiation of the bromobenzene, so that the radioactive isotope Br⁸⁰, which has a half-life of 4.4 hours, is no longer present.

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A thin-wall aluminum self-extinguishing Geiger-Mueller counter of the generally known construction was used in measuring the radioactivity, and the customary and familiar apparatus and experimental setup were applied. In view of the rapid decay of the tracer element, a correction arrived at by means of a simple mathematical calculation had to be introduced. A sample of the original solution was used as a standard, and the decay in that solution was measured to obtain an experimental check of the actual correction which had been applied.

The distribution of the introduced bromine with respect to various organs practically did not change during the time in which the experiments were carried out (29½ hours). It apparently reflects the normal distribution of bromine in the organism. The activity observed in eight organs (average of results obtained on four experimental animals) with reference to an activity of 100 for the experimental solution was as follows:

Liver	78
Kidneys	87
Brain	29
Blood	148
Salivary glands	73
Superarenal glands	37
Thyroid gland	202
Hypophysis	65

Differences of bromine content in various parts of the same organ could be clearly observed. Thus, the cortex tissue of kidneys exhibited a relative average activity of 86.1 (with values fluctuating from 47.9 to 190.0) as compared with the medullar tissue of kidneys, which had an average activity of 154.5 (fluctuations from 65.8 to 283). While the values 215, 600, 318, and 357 were obtained for blood plasma, the corresponding values for blood corpuscles were 75, 123, 139, and 116. The occurrence of radioactive bromine in some organ may be the result of one or several of the following three processes which determine the quantity of radioactive bromine deposited in that organ:

1. Radioactive bromine introduced together with bromide may enter into an exchange reaction, thus replacing the soluble form of bromine. This may take place in organs which are rich in bromine, such as the thyroid gland.
2. Radioactive bromine may be deposited in large quantities wherever there is a high rate of bromine metabolism. This supposedly occurs in the hypophysis.
3. Radioactive bromine may occur where it replaces chlorine ions, for instance, in the wall of the stomach.

The results of the investigation can be summarized as follows:

The highest relative activity of Br^{82} was observed in blood, urea (358, 171, and 209), the medullar tissue of kidneys, the thyroid gland, and in some cases in the hypophysis.

A medium relative activity of Br^{82} was observed in the lungs (87.4), liver, spleen (74.2), superarenals, thymus gland (63.5), salivary glands, lymphatic glands (69.3), seminal glands (69.8), and ovaries (62.7 and 51.6).

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Very low values of relative activity were found in various parts of the cerebrum -- cerebral cortex (33.7), pons (38.2), mesocephalon (33.5 and 15.9).

The lowest relative activity (23.1) was observed in muscles.

These results indicate the normal distribution of introduced bromine in the organism. The next stage of the investigation will deal with the effect of functional disturbances on the bromine content and bromine distribution.

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